

**Project Title:** Organic Carbon-Limestone Based PRBs for Treatment of Pb and Acidity

**Investigators:** Ralph Ludwig, Rick Wilkin, Steven Acree, Randall Ross, Ann Keeley, Frank Beck, Patrick Clark

**Problem Definition:** The Delatte Metals site is a former battery recycling facility. Spent batteries buried on site over many years has resulted in the formation of a large acid and dissolved phase lead (Pb) plume migrating toward a nearby creek. A pilot PRB consisting of a combination of cow manure, wood chips, and limestone gravel and a full-scale PRB consisting of cow manure and limestone gravel were installed in the path of the plume in May 2003. The two PRB systems are designed to remove Pb and acidity from solution through the process of microbially-mediated sulfate reduction.

**Background:** Sulfate reduction based PRB systems are increasingly being recognized as an effective means of removing heavy metals from solution. In the process of sulfate reduction, sulfides are produced which combine with the metals to produce relatively insoluble metal sulfides. In addition, during the microbially-mediated sulfate reduction process, carbonate alkalinity is produced which serves to help neutralize acidity and maintain circum-neutral pH conditions. Although promising, organic carbon based PRB systems have not yet been fully evaluated in the field. Questions of key interest include the longevity of organic carbon based systems, the ability of organic carbon based PRB systems to maintain their hydraulic conductivity properties over time, and the types of organic carbon substrate most suitable for use in PRBs.

**Objectives:** The objectives of the study are to determine whether the two PRB systems are effective in removing Pb and acidity from the groundwater; whether the hydraulic conductivity properties of the PRBs are maintained over time; and how long the PRBs remain sufficiently reactive to remove the Pb and neutralize the acidity.

**Approach:** Transects of nested well systems will be installed through each of the two PRBs allowing for collection of samples within, up-gradient, and down-gradient of the PRBs. Groundwater samples will be analyzed for multiple parameters including cations, anions, TOC/DOC, TIC/DIC, sulfide, alkalinity, ORP, pH, conductivity, and ferrous iron. Comparison of data up-gradient, within, and down-gradient of the PRB will be used to evaluate performance of the PRB. Hydraulic conductivity testing within and outside the PRB will be used to evaluate hydraulic conductivity changes, if any, during the course of the study. Solid-phase analysis will be conducted on core samples collected from the PRB to determine the types of precipitates being deposited and their potential impact on the longterm performance of the PRB.

**Accomplishments to Date:** The two PRB systems were installed in May 2003.

**Near Future Tasks:** Transects are scheduled to be installed through each of the two PRBs in September 2003 and sampling of the transects will begin in late fall 2003. .